Resistive Memory Devices for Radiation Resistant Non-Volatile Memory

Completed Technology Project (2014 - 2018)

Project Introduction

Ionizing radiation in space can damage electronic equipment, corrupting data and even disabling computers. Radiation resistant (rad hard) strategies must be employed to prolong the usefulness of electronics in space. Current rad hard strategies use redundant wiring or failsafe programming to minimize radiation damage. These strategies have drawbacks. Redundant wiring increases the amount of circuitry required, while failsafe programming typically requires extra memory, and can slow data processing. Rather than employ secondary rad hard strategies, we seek to build electronic components that are inherently rad hard. Resistive memory is a promising new form of memory that appears to be resistant to radiation. Hafnium oxide-based ReRAM has been show to have some degree of resistance to radiation damage. Tantalum oxide-based ReRAM has not been investigated, but has several properties making it superior to hafnium oxide for memory applications. Therefore, a comprehensive study of the radiation resistance of tantalum oxide will be performed. Further investigations with hafnium oxide will also be performed for comparison. Devices will be irradiated primarily with protons, alpha particles, gamma rays, and x-rays. Particles will range from a few hundred keV to 1 MeV.

Anticipated Benefits

Current rad hard strategies use redundant wiring or failsafe programming to minimize radiation damage. These strategies have drawbacks. Redundant wiring increases the amount of circuitry required, while failsafe programming typically requires extra memory, and can slow data processing. Rather than employ secondary rad hard strategies, we seek to build electronic components that are inherently rad hard.

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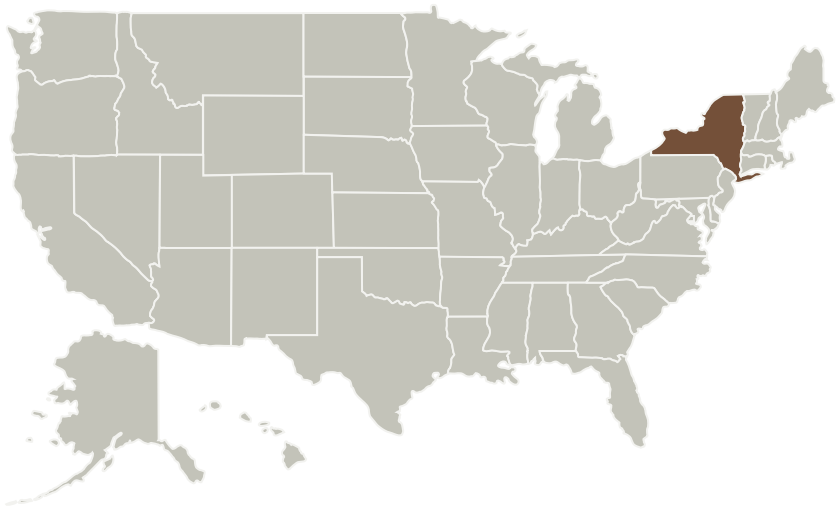
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
SUNY at Albany	Lead Organization	Academia	Albany, New York

Primary U.S. Work Locations
New York

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SUNY at Albany

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Nathaniel Cady

Co-Investigator:

Joshua Holt

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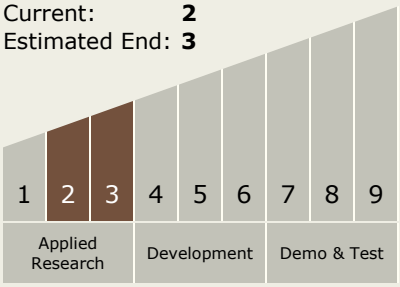
Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **3**



Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.1 Radiation Hardened Extreme Environment Components and Implementations

Target Destinations

The Moon, Mars, Others Inside the Solar System